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Dispersant Monitoring and Assessment Directive

I. Plume Monitoring and Assessment Plan for Subsurface Dispersant Application

BP shall implement the approved Dispersed Plume Characterization Plan for Subsurface Dispersant Application. Part 1 of the plan is a "Proof of Concept" to determine if subsurface dispersant operation is chemically dispersing the oil plume. Once the "Proof of Concept" test is complete, the results will be reviewed by the RRT for a decision to proceed or not proceed with Part 2 of the plan. Part 2 of the plan involves robust sampling to detect and delineate the dispersed plume Part 3, entitled "Subsurface Injection of Dispersant", outlines the operational procedures. Additional guidance will be provided by the RRT coordination group on specific implementation of this directive and that guidance will be considered an addendum to this directive.

At least 24 hours prior to the testing, use and/or application of any subsurface dispersants, BP shall provide a *Dispersant Application Plan* that identifies the dispersants to be used, describes the methods and equipment used to inject the dispersant, plume model to assure representative sampling, proposed method of visual observation, process for determining the effectiveness of subsurface injection, the specific injection rate (i.e., gallons/minute), the total amount to be used for the duration of the test, the total length of time that dispersant is injected, and the plan for sampling and monitoring, as approved by the Unified Command Environmental Unit. Dispersants must be on the approved product schedule and suitable for this use.

All data shall be provided to the United States Coast Guard (USCG) Federal On-Scene Coordinator, and the Environmental Protection Agency (EPA) Regional Response Team (RRT) representative within 24 hours of the information being received. This data includes real time monitoring, laboratory analysis, documented observations, photographs, video, and any other information related to subsurface dispersant application.

BP shall conduct Part 1 monitoring and collect the data outlined below to determine dispersed plume concentration and transport. BP shall conduct Part 2 monitoring and collect the data outlined below, which will be sustained and more comprehensive, to address plume fate and effects on ~~aquatic~~ life from the dispersed plume and chemical dispersants based on the results of Part 1 and iterative hydrodynamic modeling output. * ROTIFER ONLY [initials] MEL

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<u>Timing</u>: BP shall commence Part 1 monitoring when subsurface application of dispersant is initiated. BP shall ensure that the R/V Brooks McCall or equivalent on location is outfitted, and manned before subsurface application commences.

Part 1

BP shall design and implement a Part 1 monitoring plan to determine the factors needed to calculate dispersion effectiveness, namely, % oil, % water, % dispersant. This phase of

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sampling should determine the factors to predict buoyancy; namely ~~bubble~~ sizes, density (or specific gravity) along the thermal gradient of the water column, and kinematic viscosity. RDC for SC

Part 2

IF PART 1 IS SUCCESSFUL AND CONTINUOUS SUBSEA INJECTION PROCEEDS

BP shall design and implement a Part 2 monitoring plan to collect and report, on a daily basis, the data and information described below. BP shall submit this plan to the FOSC and EPA RRT Co Chair for approval and shall begin implementation upon notice from the Coast Guard and EPA. BP shall continue implementation of this plan until further notification from the Coast Guard and EPA. [1]

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BP's monitoring plan shall include a more thorough oil analysis, to enable EPA to determine whether the dispersed plume is toxic to aquatic life. This plan shall be designed and implemented to determine whether the dispersed oil will hang in the water column and eventually come in contact with the benthos as it approaches land. BP has the option of conducting this particular monitoring and analysis as part of Part 1 if so desired.

PART 1 – Proof of Concept – Data Collection Requirement

- Towed Fluorometer at 1 meter
- LISST Particle Analysis at various intervals from surface to 550 meters
- Dissolved Oxygen at various intervals from surface to 550 meters
- CTD – Conductivity, Temperature, and Depth at various intervals from surface to 550 meters
- Water sampling from surface to 550 meters for PAH analysis
- Aerial Visual Observation - WEATHER PERMITTING AJJ MEL RDC for SC

PART 2 – Characterization Plan – Data Collection Requirement

- Cast Fluorometer – surface to sea floor
- LISST Particle Analysis at various intervals from surface to sea floor
- Dissolved Oxygen at various intervals from surface to sea floor
- CTD – Conductivity, Temperature, and Depth at various intervals from surface to sea floor
- Water sampling from surface to 550 meters for PAH analysis
- Aerial Visual Observation
- Rototox toxicity testing
- UV-Fluorescence testing to meet objectives in Appendix A

PART 3 – Subsurface Injection of Dispersant – Parameter Requirements

- Type of dispersant to be used

[1] See Appendix A for further background

- Rate of dispersant injection
- Process for monitoring pumping rate
- Procedures for FOSC to start and stop injection

Evaluation Criteria to Determine Operational Shut-Down of Subsurface Sea Dispersant Application:

The Federal On-Scene Coordinator will immediately convene the Regional Response Team (RRT) when either of the following conditions is reported:

1. If there is a significant reduction in DO from background to below 2 mg/L; or

2. If EPA's interpretation of the toxicity test reveals excessive exertion of a toxic response. To determine a measurable toxic response, BP must first perform a rangefinder test since the collection of the sample will be directly from the toxic plume, and any sample from the plume will likely kill 100% of the test population. Therefore, the rangefinder must first be conducted to determine an order of magnitude dilution that gives a measurable response. Then, a more refined dilution procedure must be done to get the final LC50 answer. This result will be compared to a NOAA plume model that would predict when or where exertion of that toxic response would take place. EPA and NOAA will interpret the results of the toxicity tests to inform determination of a shutdown decision.

ONLY APPLIES TO PART 2
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The RRT will evaluate the conditions above, in addition to all relevant factors including shoreline, surface water, and other human health and ecological impacts, to determine whether subsurface dispersant application should be shut down.

Limitations to Address

BP shall include in its monitoring plan provisions to address and minimize the impact of the following challenges:

1. Timely transport of samples to labs where necessary, which may be subject to weather and/or operational delays.
2. Sampling in the deep sea environment may pose challenges due to equipment limitations and malfunctions.

Quality Assurance and Sampling Plan Requirements

BP's plan shall include sample collection methodology, handling, chain of custody and decontamination procedures to ensure the highest quality data will be collected. Discrete samples shall be tested at an approved lab(s). ~~Triplicate~~ samples shall be tested. All samples (or as practicably possible) shall be archived for potential future analysis. Where technically possible, all samples shall be at least 100 ml.

TRIPLICATE NOT POSSIBLE DUPLICATES ONLY
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BP shall include the following components and criteria in its Sampling Plan:

1. An Introduction, to include project objective and project staff
2. A brief site description and background
3. A description of the Sampling Approach and Procedures, to encompass:
   a. A brief overview of sampling activities, data quality objectives, and health and safety implementation strategies (frequently, this references another specific document, but must be included).
   b. The actual sampling and/or monitoring approach, to ensure repeatability and consistent procedures. Describe sampling, monitoring, sampling and field QC procedures, spoil or waste disposal procedures resulting from this effort, as well as specimen/data handling issues.
   c. Sample management – how the sample will be procured, handled, and delivered
   d. Sample instructions- preservation, containers, and hold times
4. The analytical approach – what lab tests will be run, any special instructions, how the data will be verified, and how data will be reported.
5. Quality Assurance- custody procedures, field records including logs, chain of custody, qualitative data handling including photographs.

II. Special Monitoring of Applied Response Technologies ("SMART") Protocol for Surface Application of Dispersants

BP shall immediately implement the Special Monitoring of Applied Response Technologies ("SMART") Protocol (attached as Appendix B) at the Tier III level for surface application of dispersants. Results from Tier III monitoring must be shared with the Area Command Environmental Unit. If Tier III is not deemed to be sufficient, further direction will be provided.

Mary E Landry Date: 5/9/10

Mary E. Landry
Rear Admiral, USCG
Federal On-Scene Coordinator

Samuel Coleman Date: 5/9/10

Samuel Coleman, P.E.
Director
Superfund Division
U.S. EPA Region 6
Dallas, TX 75202

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NOT APPLICABLE TO SUBSEA DISPERSION MEL — [illegible]

RDC for SC

Mary E. Landry Date: 5/10/2010
Mary E. Landry
Rear Admiral, USCG
Federal On-Scene Coordinator

Date:
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Director
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U.S. EPA Region 6
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5-10-10

Appendix A –Background for Part 2 Methodology for Informational Purposes

The fact that many organic compounds fluoresce at specific excitation and emission wavelengths is the basis for identifying many of the components of crude oil in seawater. When subject to excitation at 245-280 nm, polycyclic aromatic hydrocarbons (PAH) fluoresce over wavelengths of 310 to > 400 nm, depending on the number of aromatic rings in the structure. Only one group has examined the 2D UV Fluorescence Spectroscopy (UVFS) spectra of oil treated with chemical dispersants, the Ken Lee group at Fisheries and Oceans Canada (DFO). They found that a fixed excitation wavelength of 280 nm works best for fluorescence of PAHs in crude oil, and two different emission wavelengths, one at 340 nm for 1-and 2-ring PAHs and the other at 445 nm for 3-ring and higher PAHS, provide an excellent fingerprint for differentiating chemically dispersed oil from non-dispersed oil. As oil gets dispersed due to the action of a chemical dispersant, the peak height at 445 nm becomes highly pronounced relative to the peak height at 340 nm. Thus, computing the ratio of peak height at 340 to the peak height at 445 gives a direct measurement of the degree of dispersion that has taken place as a result of applying a dispersant to an oil.

The effect of oil dispersion on UVFS spectra can be expressed in terms of an emission ratio, so that dispersion can be tracked without having to measure oil concentration. The spectral changes associated with the application of dispersant can also be calibrated to quantify increasing oil or oil plus dispersant. The fact that UVFS and UVA data are comparable at an emission intensity of 445 nm or over the whole spectrum of intensities (from 300 - 500 nm) indicates that the fate of higher molecular weight (> 3-ring) PAH fractions - the more "dispersible" fraction of an oil slick - will provide a good idea of the fate of the oil as a whole during the dispersion process. Given that higher molecular weight PAHs may be associated with many of the persistent (or chronic) toxic effects of crude oils on marine organisms, the ability of UVFS to track "dispersible" fractions would make it a particularly useful tool in studies of the long-term toxic effects of dispersed oil.